CLAIMS

1. A method for spatially modulating radiation comprising:

directing at least one radiation beam upon at least one surface acoustic wave diffractive element;

and driving at least one of said surface acoustic diffractive elements with a plurality of modulating signals to generate a plurality of independently modulated output radiation beams having parameters.

2. The method of claim 1 wherein the modulating signals are electrical.

3. The method of claim 1 wherein the driving comprises modulating at least one output radiation beam parameter selected from the group consisting of the direction, the amplitude, phase, and frequency of the modulated output radiation beams.

4. The method of claim 2 wherein the driving comprises applying a plurality of separate modulating signals for each surface acoustic wave diffractive element.

5. The method of claim 4 wherein at least one of the modulating signals is characterized by a plurality of frequencies.

6. The method of claim 1 wherein the radiation beam directing is with a laser.

7. The method of claim 1 wherein the radiation beam directing is with a pulsed radiation beam.

8. The method of claim 7 including timing the pulse of radiation to diffract from a surface acoustic wave diffractive element after a predetermined diffractive pattern has propagated to a predetermined location.

9. The method of claim 1 and further comprising directing the modulated output radiation beams upon photosensitive material.

~~10. Apparatus for spatially modulating radiation comprising:~~

10. Apparatus for spatially modulating radiation comprising:
at least one surface acoustic wave diffractive element, each element having a surface,
at least one transducer of surface acoustic waves,
a source of a plurality of modulating signals driving the at least one transducer to transduce a surface acoustic wave in the surface of at least one of said surface acoustic wave diffractive elements,
a source of at least one input radiation beam constructed and arranged so that at least a portion of the input radiation beam strikes a surface acoustic wave diffractive element from outside the surface of that surface acoustic wave diffractive element,
and a plurality of modulated output radiation beams modulated by respective ones of said modulating signals.

11. The apparatus of claim 10 wherein the source of radiation is a laser having a cavity.

12. The apparatus of claim 11 wherein the surface acoustic wave diffractive elements are positioned inside the laser cavity so as to direct the output radiation beams out of the laser cavity.

13. The apparatus of claim 12 further comprising an optical beam director system in optical communication with the at least one surface acoustic wave diffraction element, which optical beam director system is constructed and arranged to direct the input radiation beam into the laser cavity and the modulated radiation beams out of the laser cavity.

14. The apparatus of claim 10 wherein said at least one surface acoustic wave diffractive element has an active area.

15. The apparatus of claim 14 wherein the active area is a piezoelectric.

16. The apparatus of claim 14 wherein said active area has a reflectivity greater than zero.

17. The apparatus of claim 14 wherein said active area has a transmissivity greater than zero.

18. The apparatus of claim 14 wherein the active area is patterned.

19. The apparatus of claim 14 wherein said active area is on a curved surface.

20. The apparatus of claim 14 wherein said active area comprises multiple regions with different material.

21. The apparatus of claim 14 wherein the transducer comprises interdigital electrodes deposited on top of a piezoelectric substrate.

22. The apparatus of claim 21 wherein the interdigital electrodes are regularly spaced.

23. The apparatus of claim 21 wherein the interdigital electrodes are irregularly spaced.

24. The apparatus of claim 10 wherein the at least one surface acoustic wave diffractive element includes at least one transducer to create surface acoustic waves in a plurality of adjacent active areas, the plurality of adjacent active areas being situated so as to receive portions of the source of beam of radiation and wherein the transducer is used to generate surface acoustic waves in the plurality of active areas.

25. The apparatus of claim 24 wherein the at least one transducer responds to at least one frequency of the modulating signals.

26. The apparatus of claim 14 and further comprising a second transducer, the at least one transducer being electrically connected to said second transducer.

27. The apparatus of claim 14 and further comprising at least one second transducer constructed and arranged to transduce acoustic energy into electrical energy.

28. The apparatus of claim 14 and further comprising a second surface acoustic wave diffractive element wherein the at least one surface acoustic wave diffractive element is located on the same substrate as the second surface acoustic wave diffractive element.

29. The apparatus of claim 28 wherein the at least a first surface acoustic wave diffractive element is separated from the at least a second surface acoustic wave diffractive element by gaps in the substrate.

30. The apparatus of claim 10 wherein the source of modulating signals provides radio frequency electrical signals.